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March 2003 Issue

Editorial Note:

We regret that this issue of the NSSDC Newsletter is so late. As you will note in one of the articles in this issue, Joe King had recently retired as the head of the NSSDC. He also took care of editing and assuring the publishing of the NSSDC Newsletter, so there have been some bumps in the changeover of responsibility to different persons. We hope that future issues will be available quarterly online as they have been in the past.

Jim Thieman

Live From the Aurora - Sun-Earth Day 2003

Sun-Earth Connection Education Forum To Lead International Education Program Around The Venus Transit

Results of Spring 2003 CCSDS International Standards Workshop

Curator:  Nate James
Responsible Official: Donald M. Sawyer, Code 633
Last Revised: Monday, 22-May-2003 [NLJ]

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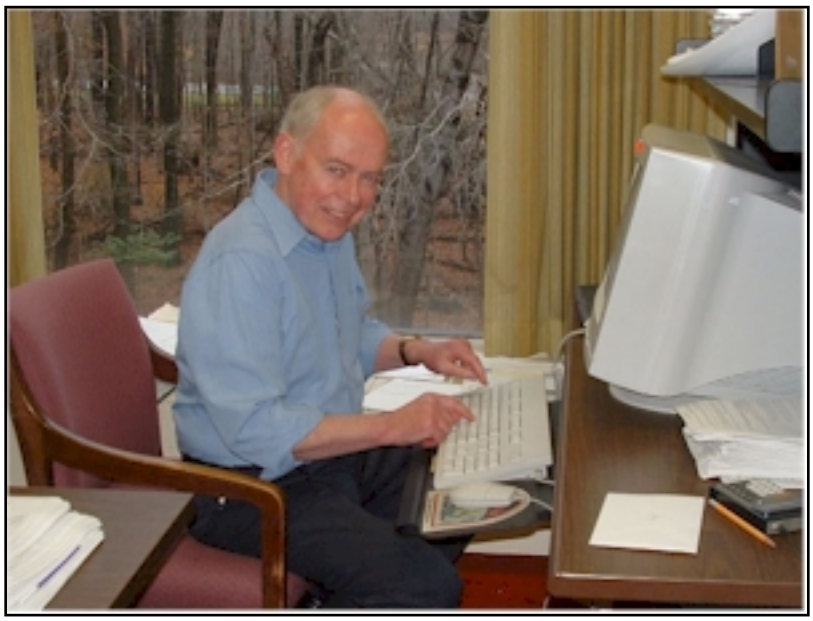
NSSDC Alumnus, Joe King, Stays NASA-Involved

By Natalia Papitashvili, Code 633

Five weeks after his January retirement from NASA, NSSDC's former Head, Dr. Joseph King, started work with a local contractor, QSS Group, Inc. He splits his time between support for Goddard's Living With a Star (LWS) Program Office and development of the OMNI-2 near-Earth heliospheric data set.



For LWS, he supports a systems engineering task oriented towards defining and implementing parts of an LWS data environment. The core elements of this environment will be capabilities defined and built by individual LWS missions (e.g., Solar Dynamics Observatory), while the "program level" additions will provide needed supplementary capabilities and integrations across these mission-specific facilities.

OMNI-2 will be a new version of the multi-source OMNI data set first assembled by Joe in the mid-1970's. The new version will have hourly averaged magnetic field and plasma data from the nearby solar wind, energetic particle fluxes and solar and geomagnetic activity indices.

New parameters will include alpha particle to proton density ratios, AE (auroral electrojet) geomagnetic indices, and several NSSDC-computed parameters: electric field (Ey, gsm), solar wind pressure, and Alfven Mach number.

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New approaches to time-shifting data from "distant" spacecraft (ISEE 3, Wind, ACE) to Earth will be used. A new proton density normalization will be used to yield flow pressures more likely to be absolutely correct.

This author continues to work with Joe in the evolution of OMNI-2.

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Last Revised: Friday, 09-May-2003 [NLJ]

Using EAST Tools to Validate and Transform Any Data

By John Garrett, Betty Brinker, and Donald Sawyer

Introduction

Long term archives, such as the NSSDC, typically find themselves in possession of data in many different formats that were created on a variety of different data platforms. Not only is the format of each data set logically different, but the variety of platforms used may result in many different representations of the base data types such as integer and real numbers. One important function for any such long-term archive is to ensure that such data remain available and usable to the community. The continuing development of standards based data description languages and associated tools is providing some new possibilities for archives to efficiently manage, validate and transform their data holdings.

The Standard Data Description Language - EAST

EAST (not an acronym) is a data description language that supplies complete and non-ambiguous information about the format of the described data. An intrinsic need when describing data is to specify the representation of the interchanged data, including the logical structure of the data and the physical, bit level representation of the individual data items. When allowing for the wide diversity of variables such as the operating systems and the machine representations for numeric values, a full understanding of data can only be reached by using a rigorous notation/language that provides a complete, non-ambiguous logical and physical description. EAST is used for this purpose.

EAST is designed for building descriptions of data to be contained separately from the data itself. Note that EAST is a data description language and is not itself a data format. Users of EAST maintain and use their data in whatever formats are most useful to them. EAST is used to describe those various formats without any requirement to change the actual data. EAST was designed with three overriding concerns: data description capabilities, human readability, and computer interpretability.

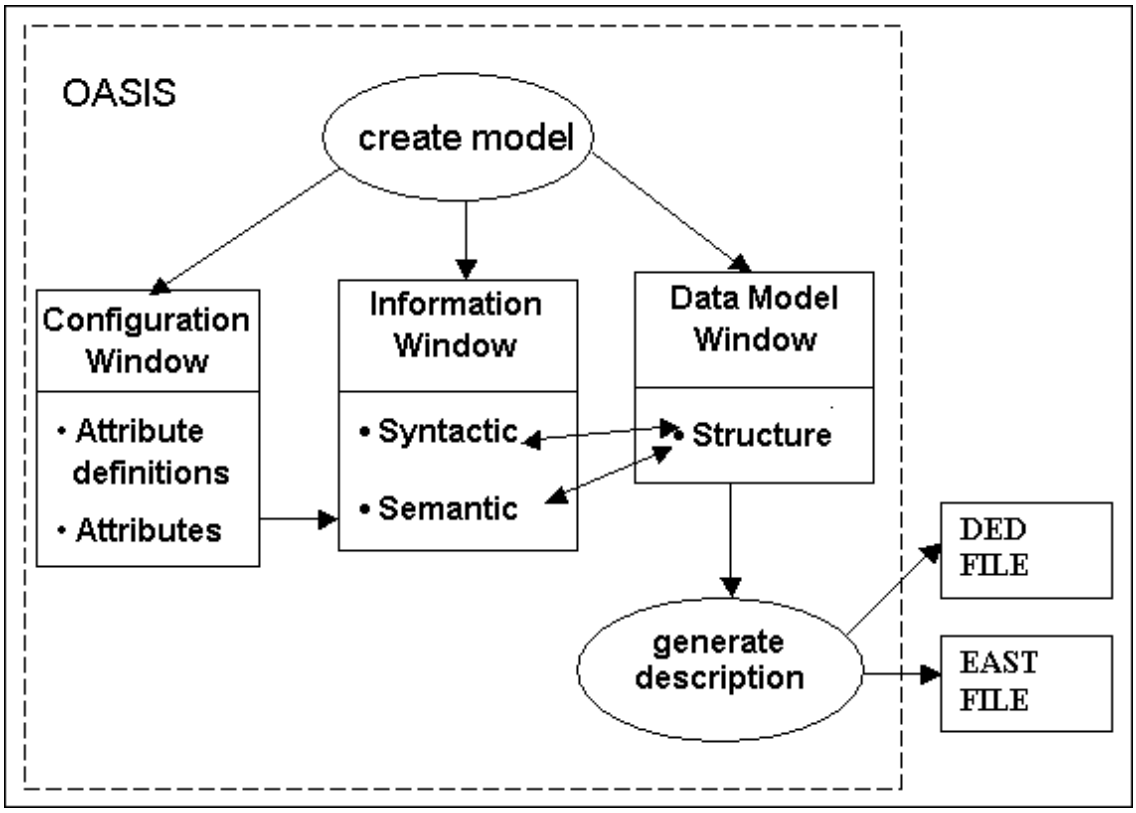
The EAST specification document (available from the CCSDS web site at: http://www.ccsds.org/) provides the syntax and semantic rules for EAST. The EAST specification has been endorsed as an International Standard by the International Organization for Standardization (ISO) and as a Recommendation for Space Data Standards by the Consultative Committee for Space Data Systems (CCSDS).

EAST is designed to focus primarily on the physical components and the layout or structure of data while being able to interact with complementary standards and tools that have a stronger emphasis on the semantics, or meaning, of the data. One such complementary standard is the Data Entity Dictionary Specification Language (DEDSL) defined by the Consultative Committee for Space Data Systems (CCSDS). Tools have been designed to incorporate both EAST and DEDSL to more fully describe data in standardized ways.

EAST Tool Capabilities

Although EAST is designed to be human readable, truly complete and unambiguous descriptions of complex data record structures can become lengthy and repetitive. This reality provides a motivation to have tools that provide users with several different graphical and text views of the complete set of information carried within EAST and supplemented by DEDSL information. While tools enable users to avoid learning the EAST language syntax, those who wish to do so can, because the language avoids the use of cryptic forms in favor of more English-like constructs. EAST is a formal language and not a natural language: it is a machine compatible (or interpretable) language. The formal nature of EAST allows the control of data descriptions and the interpretation of data in an automated fashion.

As shown in the following figure, EAST descriptions are created using the tool OASIS (Outil d'Aide a la Structuration d'Informations Spatiales). In the windows-based environment of OASIS, a user can model the data either before or after it actually exists and can generate files containing the EAST description and additionally files containing the Data Entity Dictionary (DED) conforming to the CCSDS/ISO DEDSL standard. The DED is also a readable and coded (currently PVL - Parameter Value Language or XML) file and contains the semantic description of the data.

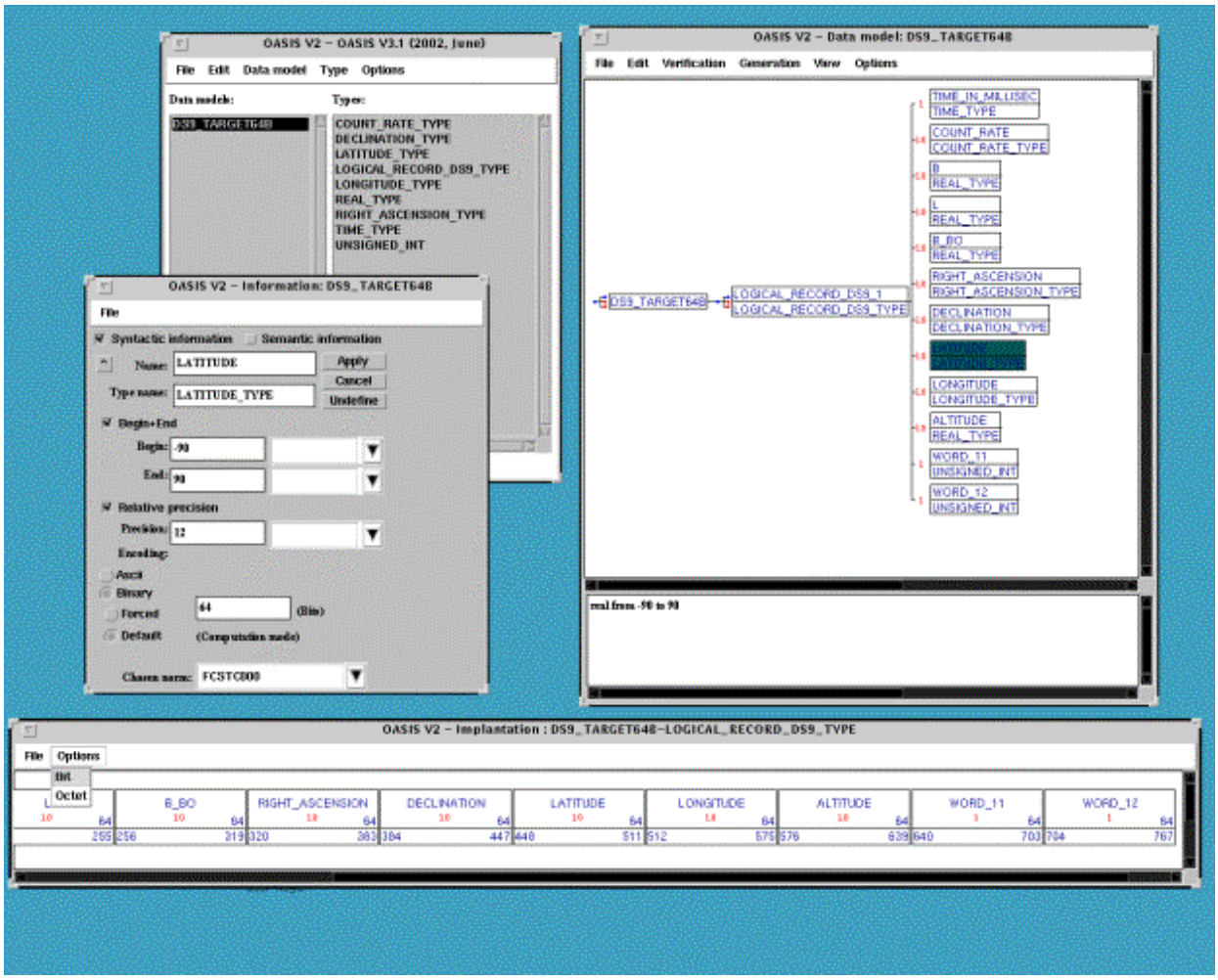


A sample view of an OASIS window, where data is being modeled, is shown below. The Data Model Window and the Information Window are displayed in this screen view of OASIS. The diagram in the Data Model Window is constructed primarily by the user's entering syntactic information for each element and node through the Information Window. Highlighting a node or element in the diagram will bring up its descriptive information in the window and provides the means for the user to enter or update further descriptive information.

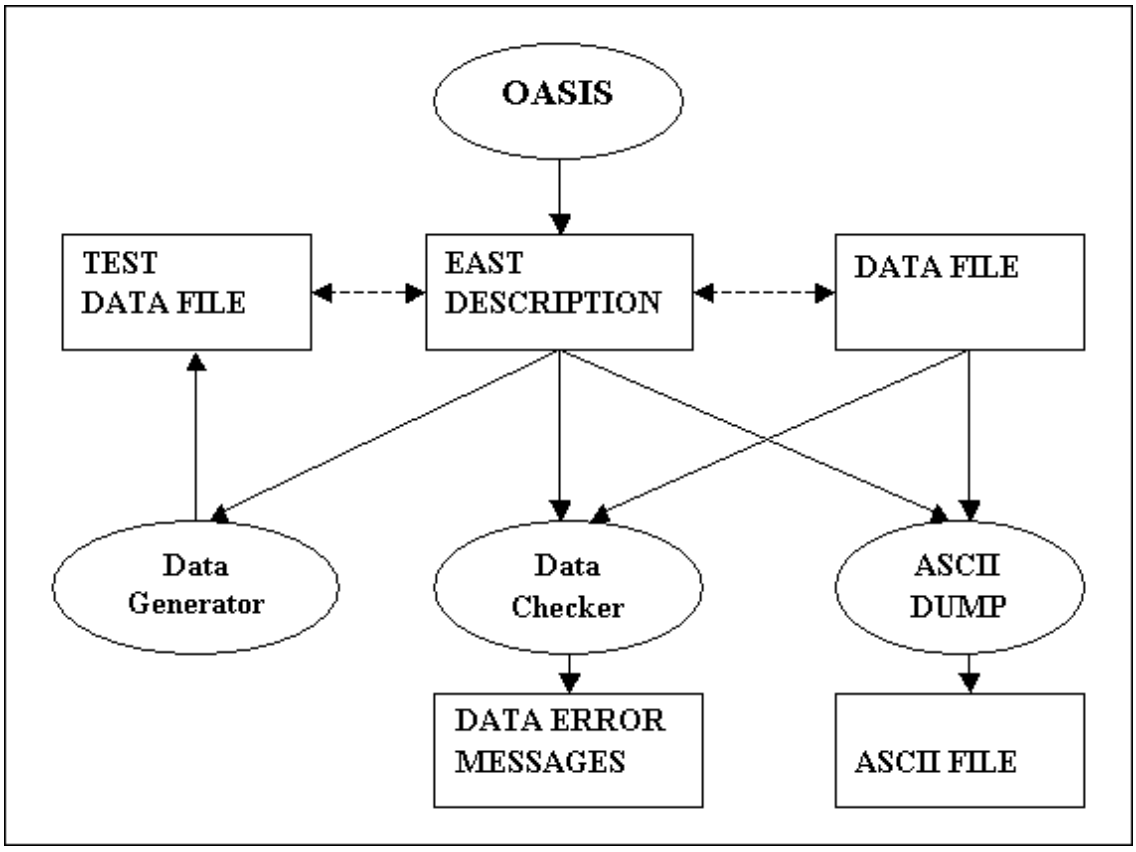
The Main Menu Window is shown at the top left of the screen. This window identifies the selected model by name and lists all of its types, or sub-models, of each element or node. For example, a type may be based on an integer or a floating point representation and may have a particular range. A node usually represents an aggregate structure of data elements, such as a record, array, or list of elements that is delimited by an end-of-file or a marker constant.

The element "LATITUDE" is highlighted in the example Data Model Window resulting in the descriptive information for "LATITUDE" being displayed in the Information Window, where changes may also be entered. In the example shown, the Information Window displays the syntactic information. If the "Semantic Information" box at the top of the window is checked by the user, then semantic information will also be displayed in this window. The semantic information portion of the window lists attributes assigned in the Configuration Window and provides a means for the user to give values to these attribute parameters.

The "Implantation View" is shown at the screen bottom. This Implantation view may be optionally displayed to show the layout of the structure in which elements such as LATITUDE are contained. A bit length option in this window is selected here, so that lengths of each element field are given in bits and its exact location in the structure is also shown.

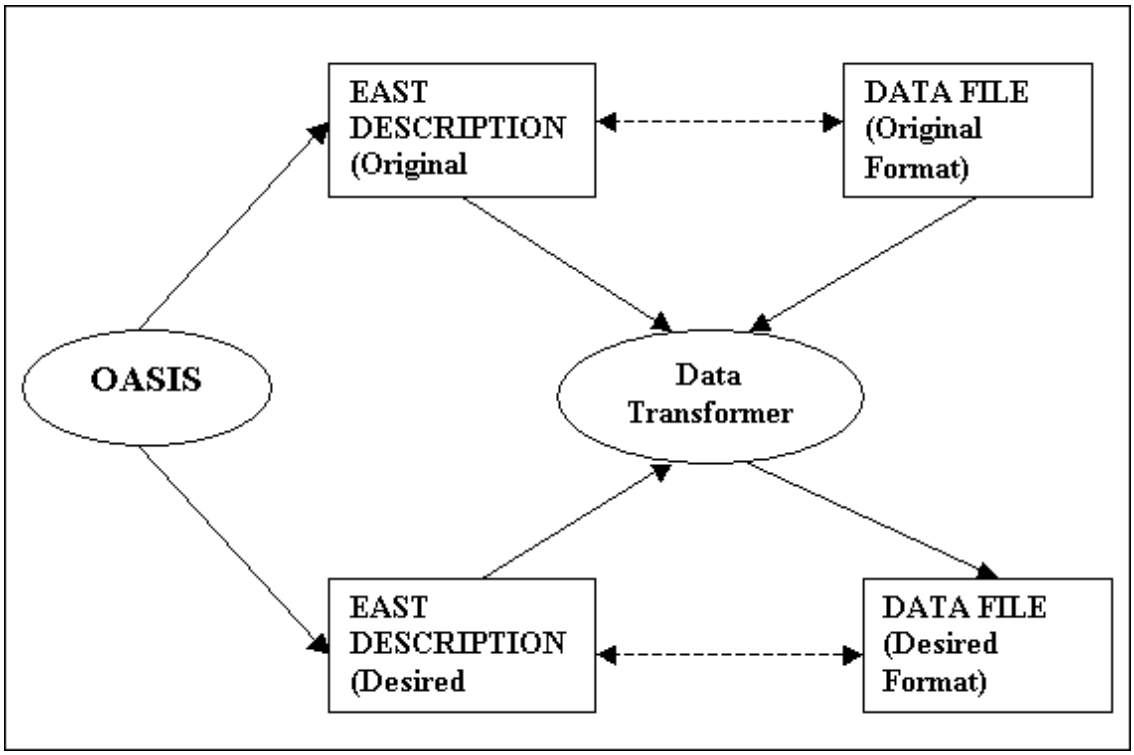


Once the EAST descriptions are created either by hand or more likely by use of the EAST OASIS tools, additional tools are available to generate test data and to validate and output existing data. The following figure shows several of the existing EAST tools and their relationships. These tools include: OASIS for creating EAST data descriptions, and three tools that make use of the generated EAST data descriptions, the Data Generator, the Data Checker, and the ASCII Dump. The Data Generator tool creates a test data file in the format described by an EAST data description. The Data Checker tool validates a given data file against a given EAST data description. The ASCII Dump tool interprets a given data file based on an EAST data description and outputs selected blocks of data to an ASCII formatted file.



The EAST tool set has recently added the capability to allow users to create transformations from a data set that is based on a particular machine representation into another rendition of the same data set that is based on a different machine representation. For example, data created for one class of machines, such as that made on the CDC3000 family of machines, can be converted to data interpretable on a Sun architecture. Conversions between other machines, including VAX, IBM, PC, and non-standard architectures, are also possible.

The conversion process is shown in the following figure where OASIS is used to create an EAST data description of both the original file format and the desired file format. These two EAST data descriptions and the original file are inputs to the Data Transformer tool. The tool creates a data file in the desired format as an output.



Interfaces to the EAST tool set modules are available in C, FORTRAN, and Ada. We have used C to compile with the EAST library and to form other tools we may want for a particular application.

Initial Experience with Tools

The NSSDC has begun to study the possibility of using the EAST Tools to validate and convert data sets that were originally created on now obsolete systems. As a first step, EAST descriptions of the data sets in their current format are being created. Then an EAST description of a new format, with representations in IEEE form, is created. The EAST tools are used to first validate the content of the data set with its input format and then to transform the data to the new format.

This conversion process is helpful for both the data set users and the archive. Users will benefit because they no longer need to create specialized software to read and make use of these data sets. The archive will benefit by the decreased demand on staff time to support users trying to make use of the data sets in those obsolete formats. NSSDC is still in the study phase for this effort, but the initial prototypes dealing with conversion of a single data set seem to be very promising.

Since NSSDC is in close communication with the EAST Tool Development Team in the French Space Agency, CNES, the results of this testing will be fed back to these developers. The feedback should result in further improvements in the design of the EAST tools and should suggest updates for increasing throughput when dealing with large sizes and large numbers of data sets.

Additional information and support are available through the authors or directly from the CNES EAST Team who may be contacted at east@cnes.fr.

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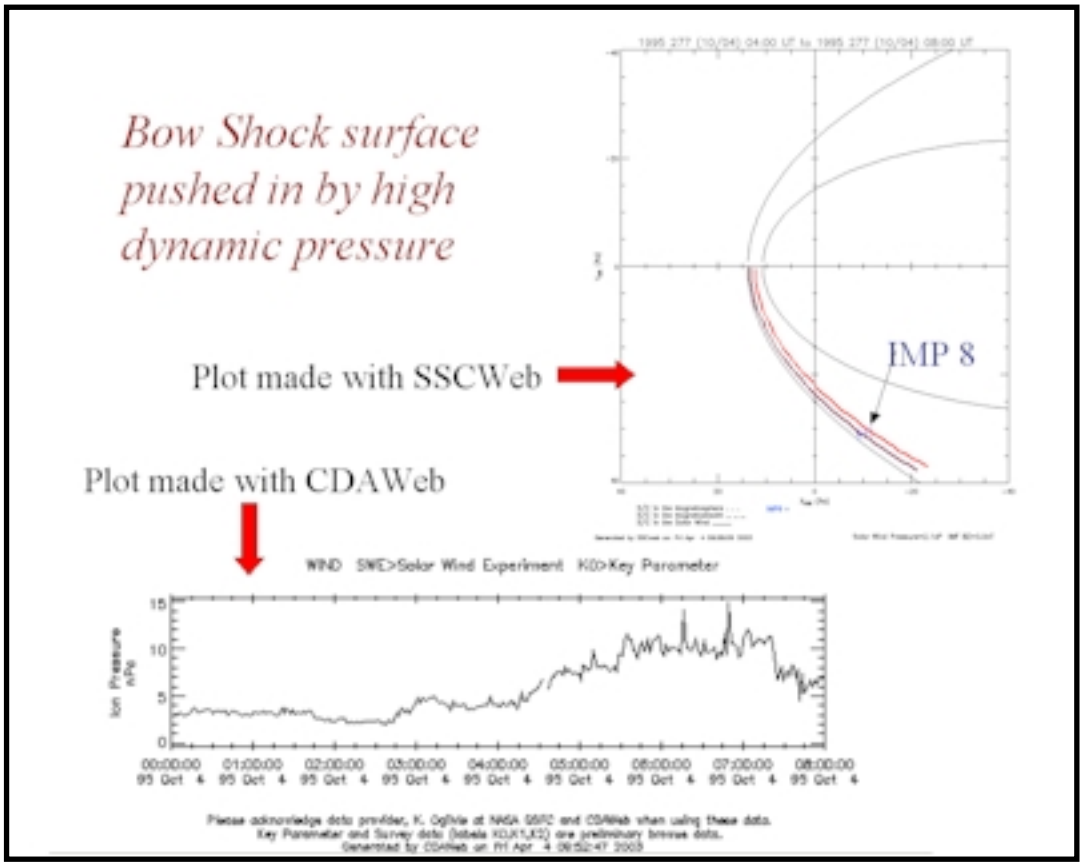
Multi-Spacecraft Bowshock Database at NSSDC

By Natalia Papitashvili, Mona Kessel, Joe King

NSSDC's bowshock crossings database at http://nssdc.gsfc.nasa.gov/ftphelper/bowshock.html has been significantly improved recently by adding data from a number of spacecraft and enhancing its web-based interactive interface. The database now includes the bowshock crossings made by the following spacecraft: IMP-8 (1992-2000), Geotail (1995-1997), Magion (1996-1997), and Cluster (2001-2002). Time coverage for each, except Magion, will be further extended.



Each record in the database contains the time and location of the actual crossing, the observed upstream interplanetary magnetic field (IMF) and solar wind plasma parameters and the downstream plasma density (IMP only), as well as several NSSDC-computed parameters (flow pressure, sonic and Alfvenic Mach numbers, beta, etc.). The record's format is the same for all spacecraft,

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although some fields have meaningful values only for IMP.

The new web-based interactive interface identified above allows users to select any combination of spacecraft, time span, and/or ranges for any parameters in the database. We have also added output sorting capabilities by date and time or by any user-selected parameter. The underlying data are accessible as annual ASCII files from ftp://nssdcftp.gsfc.nasa.gov/spacecraft_data/bowshock_crossings/.

These data and interfaces allow the user to accomplish several scientific tasks, for example, (1) find nearly simultaneous crossings; (2) specify the crossings for specific IMF and solar wind conditions; (3) find the crossings in the certain regions of the bowshock (e.g., dayside, flanks, etc).

The IMP-8 basic shock identification and specification of the upstream observables were done by the members of the IMP-8 magnetometer group at Goddard (A. Szabo, J. Merka, T. Narock) and of the MIT's IMP-8 plasma group (K. Paularena, J. Richardson, L. Finck). The Magion-4 (Interball- Tail's sub-satellite) bowshock crossings were supplied by J. Safrankova and Z. Nemecek (Charles University, Prague, Czech Rep.). The Geotail and Cluster crossings were identified by R. Kessel (GSFC).

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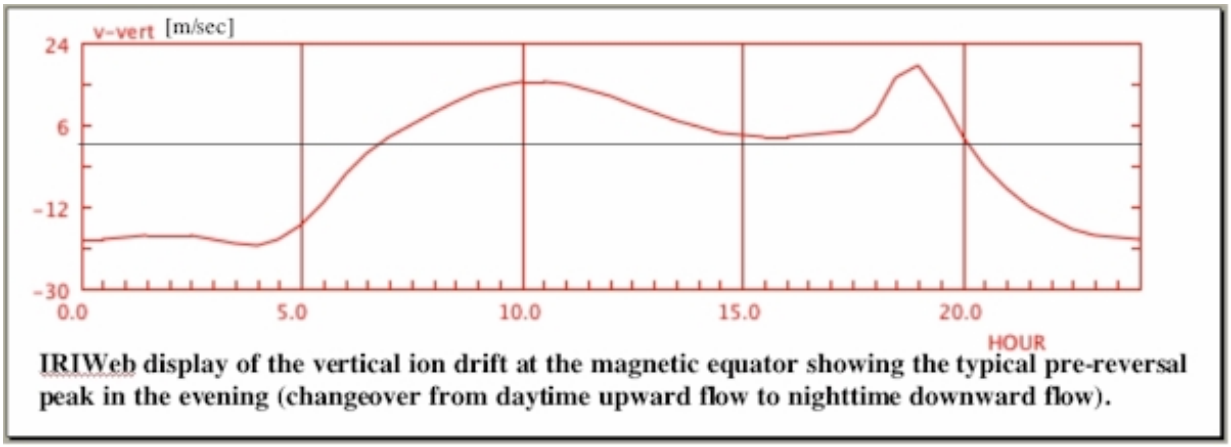
IRI Updates - IRIWeb, Model Software and Solar/Magnetic Indices

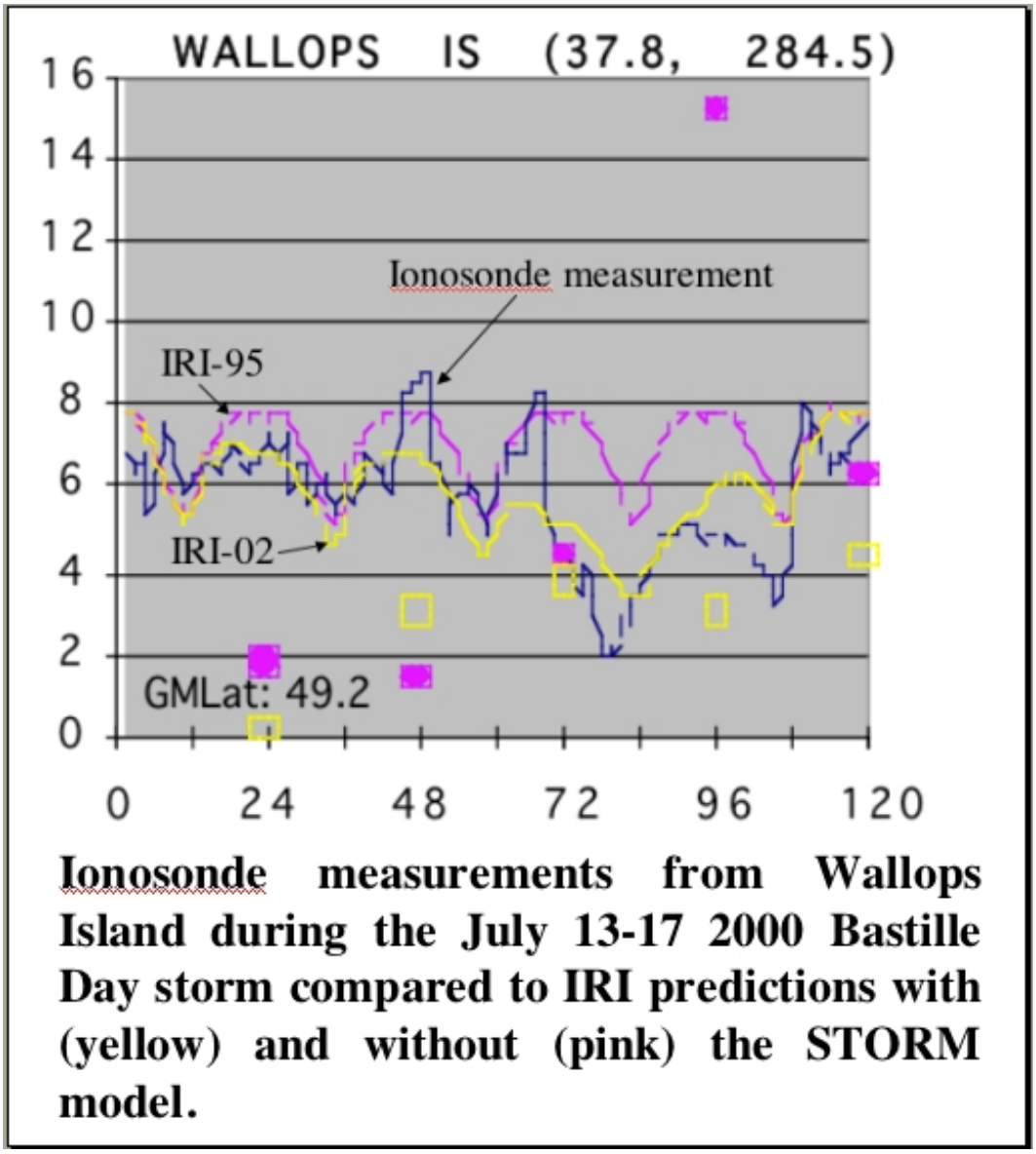
By Dieter Bilitza and Natalia Papitashvili, Code 633

The IRIWeb interface at http://nssdc.gsfc.nasa.gov/space/models/iri.html was upgraded to the latest version of the IRI (International Reference Ionosphere) model. IRIWeb lets users compute, list, and plot IRI parameters online. In addition to the traditional IRI parameters (Ne, Te, Ti, Ni, TEC) users can now also compute the equatorial vertical ion drift, the storm to quiet time ratio for the F2 peak plasma frequency (a parameter proportional to the F2 peak density), and the occurrence probability for an F1 layer. The ion drift is a critical parameter for the understanding and description of the equator anomaly phenomenon (latitudinal maxima in density on both sides of the magnetic equator) and the F1 occurrence probability was included to help HF (high frequency) radio wave propagation studies and applications. IRIWeb now also provides several new input options: (i) the user can specify the sunspot number (R) and the ionospheric global index (IG), (ii) the STORM model can be turned on and off, (iii) for the topside electron temperature the new model of Trsikova et al. (Institute of Atmospheric Physics, Prague, Czech Republic) can be used, (iv) for the D-region electron density the new model of Friedrich et al. (Graz, Austria) can be used, (v) for the F1 occurrence probability the user can choose between three model options.



IRIWeb display of the vertical ion drift at the magnetic equator showing the typical pre-reversal peak in the evening (changeover from daytime upward flow to nighttime downward flow).

Several corrections and improvements were made to the IRI code and the newest version of the program files were posted at ftp://nssdcftp.gsfc.nasa.gov/models/ionospheric/iri/iri2001/fortran_code/ in early March. These corrections are based on the feedback from IRI users who pointed out specific problems and often helped resolving them: David Simpson, GSFC, Code 692/582; Cemil B Erol, Turkey; Daniel Heynderickx, BIRA, Brussel, Belgium; Richard E. Denton, Dartmouth College, Hanover, New Hampshire; Kevin Jennings, SwRI, Texas; Bill Taylor, Raytheon ITSS, Lanham, Maryland; Minakishi Chamua, Dibrugarh University, Assam, India. Specific corrections are listed with dates and short explanations in the comment field at the top of the Fortran program files.



Ionosonde measurements from Wallops Island during the July 13-17 2000 Bastille Day storm compared to IRI predictions with (yellow) and without (pink) the STORM model.

Regular updates are made to the IRI solar and magnetic indices files based on the indices data that are available from the National Geophysical Data Center (NGDC) in Boulder, Colorado, the Ionospheric Prediction Service (IPS) in Sydney, Australia and the World Data Center C1 (WDC-C1) in Chilton, U.K. For the solar indices the file also includes predicted values and extends to December 2005. The most recent update (Feb 2003) resulted in increased R12 predictions (e.g., July 2002: from 90 to 103) and decreased IG12 predictions (July 2002: from 145 to 135).

The IRI homepage is located at http://nssdc.gsfc.nasa.gov/space/model/ionos/iri.html

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Toward a Space Physics Data Dictionary

By Ed Bell, Code 633

For several years an international consortium of scientists and software engineers from several different archives have been regularly meeting to discuss interoperability issues between space physics archives. A goal of this consortium has been to determine a method of querying, via a web interface, the disparate systems at these centers so as to produce a listing of available data, regardless of location, from which a researcher can then determine the data of interest and retrieve it. The name of this effort is SPASE (Space Physics Archive Search and Exchange). A necessary requirement of such a system is a common terminology, an interlingua, that would allow such queries across systems to speak the same language. This space physics data dictionary could be used not only as a means of exchanging data and information between archives, but could be used to uniformly search for and retrieve data for scientific analysis.

On 19 -20 March 2003 a workshop was hosted by the NSSDC at Goddard Space Flight Center to discuss this data dictionary among

SPASE Data Dictionary

Elements

The elements of the data dictionary have been divided into two categories: those deemed most useful for initial queries for space physics data and those deemed as potentially useful for distinguishing between candidate data sets.

Primary (Query) Elements

Project
The project under whose auspices the data were collected. (Typically a funding and/or management organization.) Examples: Cluster, Galileo

Observatory
The name of the spacecraft, platform, or facility that served as host for the instrument that collected the data. Examples: Cluster 1, Galileo Orbiter

Experiment Type

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a wider community. From this workshop were identified approximately twelve terms that would be useful in searching for space and/or solar physics data and a number of additional terms that would further discriminate between potentially useful data sets. Tentative definitions were outlined and further refined after the meeting by Todd King of the PDS Planetary Plasma Interactions (PPI) node at UCLA with input by other participants of the consortium.

A subsequent meeting was held at the joint AGU/EGU/EGS meeting in France on 10 April 2003. At a splinter group session, the initial draft data dictionary was presented to attendees and their input and participation on subsequent drafts solicited. Finally, a follow-up meeting was conducted in Toulouse, France on 14 April 2003 between selected participants of the SPASE consortium to determine what work was still required and how best to involve the world space physics community.

The accompanying table shows the terms deemed useful by the various participants with those in bold face being the ones deemed most useful for query purposes. Draft definitions for these terms are still in flux, but are expected to be completed during the summer. Other parts of the data dictionary, those used primarily to

A classification of the general kind of instrument used to gather the data. Examples: magnetometer, mass spectrometer

Instrument Name
The name by which the instrument used to collect the data is known.
Examples: FGM, HIC

Instrument Spatial Region
Named region(s) of space in which the instrument collecting the data was located during the collection.
Examples: solar wind, magnetosphere

Instrument Position
The coordinates in space in which the instrument collecting the data was located during the collection.

Observed Spatial Region
Named region(s) of space in which the instrument collecting the data was observing during the collection.
Examples: aurora, corona

Observed Spatial Extent
The coordinates in space in which the instrument collecting the data was observing during the collection.

characterize the data holdings, are expected by the Fall. It is anticipated that the resulting document will become a standard for archives of space physics data, enabling scientists to more easily locate, access, and use available data.

If you are interested in participating in this effort, you are encouraged to do so. For additional information or to volunteer your services, contact Dr. Jim Thieman (james.r.thieman@nasa.gov), Dr. Ed Bell (ed.bell@gsfc.nasa.gov), or Dr. Chris Harvey (harvey@cnes.fr).

Observed Time Span
The time during which data were collected.

Physical Entity
A designation of the physical quantities that were observed and measured. Examples: photons, fields (magnetic)

Physical Parameter
Used in conjunction with Physical Entity. Specifies the property which is in the data. Examples: flux, density

Product Processing Level
The form the data take as a result of the processing performed on it. Examples: raw, calibrated

Secondary (Descriptive) Elements

Abstract
Access
Data Organization
Data Set Name
Data Site
Format
Media
Product Representative Form
Related Items
Resolution
References
Tools/Services
Quality??

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NSSDC's Java Inventory (JIN): Status Report

By Edwin Bell, Code 633

As was written in the December 2002 NSSDC Newsletter (ref. http://nssdc.gsfc.nasa.gov/nssdc_news/dec02/jin.html), NSSDC is in the process of updating its off-line inventory system. Since that time, the tape portion of the system has been redone, but delivery of the initial system has been delayed until the CD portion of the system can also be delivered. Once this is completed (in late summer 2003), the existing off-line inventory system (IDA) will be retired and JIN will become operational.

Additional work which will follow this initial delivery of JIN is: (a) the addition of an inventory for NSSDC's extensive photographic holdings (going back to early Mercury flights and including the entire Apollo collection); (b) revisions to the NSSDC CD-ROM Catalog (to accommodate new features introduced in the inventory system); and, (c) steps towards integrating JIN with NSSDC's on-line inventory system, DIOnAS. These exciting changes on the horizon are anticipated to make it much easier for our customers to search, locate, and retrieve desired data from the NSSDC.

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Live From the Aurora - Sun-Earth Day 2003

By Elaine Lewis, Code 633

The NASA Sun-Earth Connection Education Forum (SECEF) and Passport to Knowledge (P2K) partnered for the major events of Sun-Earth Day, 2003. Sun-Earth Days, now in their third year, were created to communicate the excitement of the fast-moving field of Sun-Earth Connection science and research into the Sun's effects on Earth. Thousands of participants at science museums, schools, and star parties in North America and Europe talked with scientists, observed the Sun with telescopes connected to the internet, learned about the Aurora (Northern and Southern Lights), and the culture of the Northern Peoples.

Every

NASA Center and many NASA Educator Resource Centers had planned events for the public or provided training for science teachers or students in conjunction with Sun-Earth Day. Specifically, more than 9,000 teachers had been invited to education workshops related to the science of the Sun-Earth Connection. There were 215 teachers who registered through the website. Packets were distributed to support 186 scientist's efforts within museum settings and classrooms. An additional 39 museums also received support packets, and 100 packets were sent to support efforts by museums in Europe. There were also

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182 events supported by Amateur Astronomers,.

Living With A Star, a solar science documentary, was first broadcast on February 11th. This documentary prepared students for **Live From the Aurora- Sun-Earth Day 2003**,, with content and exciting science to capture the interest of students and teachers. **Live From the Aurora** on March 18th featured a real-time webcast interaction between NASA researchers on location at Poker Flat Research Range, Alaska and youngsters at the Maryland Science Center, Baltimore, MD; Chabot Space & Science Center, Oakland, CA; Fernbank Science Center, Atlanta, GA; and The Imaginarium, Anchorage, AK. Poker Flat is the world's premier site to study the aurora with sounding rockets. During the broadcast and for one hour after (13:00-15:00 Eastern Time) viewers could submit questions to a panel of NASA and University of Alaska/Geophysical Institute experts on the aurora as seen on the Passport to Knowledge website: **http://passporttoknowledge.com/sun/main.html**

The main website, **http://sunearth.gsfc.nasa.gov/sunearthday**, provided additional resources to support educators, museums, and scientists for this year's event. In addition a new feature was added in January, the Student Observation Network. Through the network students can track a solar storm and predict an aurora. Activities, web quests, and a multi-media gallery were also created to support and enhance this year's Sun-Earth Day and the ongoing Student Observation Network.

NASA's Sun-Earth Connection Education Forum (SECEF) translates and interprets the research results from NASA's solar science missions for educators and the public through training programs and educational products. P2K is the longest-running series of interactive learning adventures on public TV, and many of the shows in the series were funded by grants from NASA. In summary, the partnership between SECEF and P2K resulted in a very successful Sun-Earth Day 2003.

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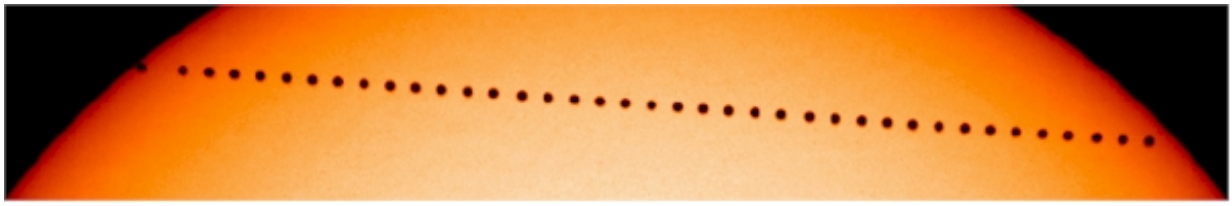
Sun-Earth Connection Education Forum To Lead International Education Program Around The Venus Transit

By Lou Mayo, Code 633

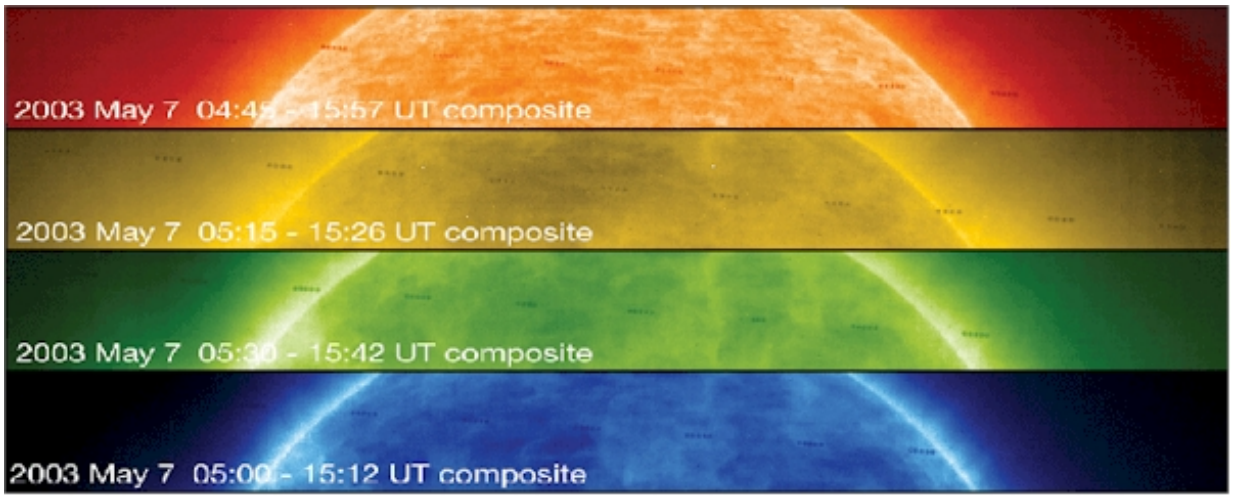


On June 8th, 2004 a celestial event of unprecedented historical scientific importance will occur when the silhouette of the planet Venus once again crosses the face of the sun as seen from the Earth. This event or transit of Venus last occurred in 1882, so no one alive today has ever witnessed it. Its importance in history lies primarily in the fact that, through parallax measurements, it allowed astronomers to define, for the first time, a fairly accurate number for the A.U. and therefore, the distance to all the other known planets. Additionally, the transit produced estimates of longitude location on the earth and provided the first evidence for an atmosphere around Venus.

Historically, expeditions were launched to all parts of the world to retrieve accurate parallax measurements. This time, professional and amateur astronomers all over the world will be waiting with sophisticated ground-based telescopes as well as spacecraft that will view the transit in a myriad of frequencies. Also this time, SECEF, the NASA Sun Earth Connection Education Forum and its partners will be facilitating participation by people all around the world with live web casts from Israel, museum and planetarium programs, observing programs with amateur astronomers, and observations of the transit made available on the web from remote solar telescopes scattered along a baseline of about 2000 miles from Nova Scotia to Brazil.

The goal is to involve as much of the student population and the public in this event as possible and to help them understand the immense importance and excitement surrounding this and previous transits through engaging activities focused on US and world history, technology, math, and astronomy. Comparisons of Venus with the Earth and Mars, calculations of the distances to nearby stars, and the use of transits to identify extra-solar planets will all add to the excitement and awe of this most rare of cosmic occurrences.

For more information on the transit and how you can participate, contact Sten Odenwald (301 286-6953) or Lou Mayo (301 286-0165) or visit Fred Espenak's Venus Transit web page at: http://sunearth.gsfc.nasa.gov/eclipse/transit/venus0412.html



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NOST News: Results of Spring 2003 CCSDS International Standards Workshop

By John Garrett and Donald Sawyer

Panel 2 of the Consultative Committee for Space Data Systems (CCSDS) held its spring 2003 workshop from 30 March - 4 April 2003. The workshop was held at the European Space Agency facility in Frascati, Italy.. This spring's Panel 2 meeting proved to be a time of changes. Some archiving standards have been published, others are just becoming draft standards and still other efforts are just getting underway. The XML thrusts within Panel 2 are continuing to develop as dominant themes for current and future work. And software tools supporting previous standards are being enhanced resulting in ever increasing use of the Panel 2 standards.

The CCSDS Panel 2 meeting opened with its sessions on archiving standards. The CCSDS Standard *Reference Model for Open Archival Information Systems (OAIS)* has now been published as ISO Standard 14721:2003. The OAIS Reference Model is being used far beyond the Space Domain. It is showing up in important ways in several National Archives and National Libraries efforts including the Library of Congress' National Digital Information Infrastructure and Preservation Program (NDIIPP) as well as in emerging implementations in the Aeronautical and Space domains.

Work is progressing well on the *Producer-Archive Interface Methodology Abstract Standard*. The Panel document was reviewed and approved for release as a draft standard. The document will be undergoing formal review by the Space Agencies and the general public for the next couple of months and plans are for it to become an approved CCSDS standard by the end of the year. Another important development in this area is the creation of prototypes of supporting software tools.

Work is also beginning on Archive Certification. To best leverage

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our contacts and our resources, the certification work is led by the Research Libraries Group with liaison from CCSDS. We expect to have continued strong Panel 2 participation in those efforts.

Panel 2 is examining the use of XML in the packaging of data. They are building on the ideas from the original Structure and Construction rules Blue Book, as well as the Information Packing concepts from the Open Archival Information Systems (OAIS) Reference Model. The concepts embodied in the OAIS Reference Model have been used by a number of other groups and the Panel 2 has collected and used the best of these ideas. The Panel has a rapid development programme underway to bring forward a draft standard by the end of the year.

The EAST Data Description Language and the Data Entity Dictionary Specification Language standards are making usage inroads in an ever-wider range of projects. This is primarily due to the continuing work on EAST tool development at the French Space Agency, CNES. There were several reports on project usage and the status of tool development.

And finally there were reports on significant efforts on the part of Panel 2 members to provide input to the *Orbit Data Messages* draft standard as well as to the work of the Architecture Working Group.

This may have been the last CCSDS meeting as Panel 2. CCSDS has been reorganizing and efforts formerly under CCSDS Panel 2 have now become part of the Mission Operations and Information Management Area. We would like to extend our congratulations to all the current and past CCSDS Panel 2 participants. Their professionalism and their dedication to the space data industry has greatly benefited all those who have had a chance to use the many standards produced over the last 18 years. We have been honored to work with them and expect to continue working with many under the new organization.

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